

**Preparedness
Gardening: How to
Grow Real
Sustenance and**

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VISIT...

LANZAROTE
Caliente.COM



PREPAREDNESS GARDENING

HOW TO GROW
REAL SUSTENANCE
& NATURALLY BUILD
SOIL FERTILITY
IN TROUBLED TIMES



Table of Contents

INTRODUCTION

1 BREAKING GROUND

2 SHAPING GROUND

SWALES

RAISED OR SUNKEN BEDS

THE SHAPE OF YOUR GARDEN

PUTTING IT ALL TOGETHER

3 BUILDING GROUND & THE SOIL FOODWEB

FERTILIZING & AMENDING SOIL

WORKING WITH TREES

OTHER ORGANIC FERTILIZERS

TRACE MINERAL PRODUCTS & OTHER AMENDMENTS

ROCK DUST

SEA MINERALS

BIOCHAR

PRACTICES THAT PROTECT AND BUILD YOUR SOIL FOR THE LONG-TERM

THE NRCS PRINCIPLES OF BUILDING SOIL HEALTH

A RESILIENT SOIL – DRY GARDENING IF TIMES GET REALLY BAD

SOIL

EARTHWORKS – FREDGES, SWALES, TERRACES, RAISED/SUNKEN BEDS

PLANT VARIETY & THE GREAT DRY GARDENING POTATO EXPERIMENT

SHADE & MULCH

OTHER DRY GARDENING ODDITIES (& FAILS)

4 YOUR STAPLES

A NOTE ON THE TRADITIONAL DIET

YOUR STAPLES

POTATOES

CORN (or not)

OTHER GRAINS – WHEATS, RYE, BARLEY, OATS

(WINTER) SQUASH

LEGUMES (BEANS & PEAS)

EGGS

ROOTS

BRASSICA FAMILY / FERMENTABLES

PUTTING IT ALL TOGETHER – GARDEN PLANS

5 A WORD ON TOOLS & SEED SAVING + GREAT INFORMATION SOURCES

TOOLS

SEED SAVING

BIBLIOGRAPHY

INTRODUCTION

Without question, we live in dangerous and unprecedented times. We are inching towards the biggest economic collapse in history – which is threatening enough on its own – on top of risks of civil unrest, international war, severe weather and natural disasters, terrorist or cyber attacks, and more. Against these, our centralized, just-in-time food delivery system, dependent upon a fragile web of power grids and telecommunication networks, is extremely vulnerable. If civilization is indeed three meals away from anarchy, there is no question that food preparedness in our troubled times is vital.

When it comes to producing our own food, there are few books that address self-reliant gardening. Almost invariably, contemporary gardening books are written for market gardening or pleasure gardening, neither of which is interested in developing food resiliency in the face of crises.

Preparedness Gardening meets that need by outlining how to garden for the purpose of food preparedness so that we can have that crucial stock of fresh food to see us through a food shortage and/or to significantly offset our grocery costs in economically hard times.

My own entry into self-reliant gardening came years ago when I slowly came to realize just how helpless I would be in a food crisis despite being well-educated and able-bodied. Since then, I have been an avid researcher and reader on everything related to growing (and raising) food and have applied various methods to the fields of our modest homestead.

In the interior of British Columbia, Canada, we have summers of intense heat and dryness like you might find in California (usually about two months of weather between 37-42C (98-107F)) but with a winter far colder and a season much, much shorter. It is a tough growing climate for many items – but it also provides rigorous

conditions to test different agricultural solutions. For example, if I can make dry-gardening work here with such heat and dryness, the odds are you can make it work too. Dry gardening is an important topic in the context of preparedness that is covered in these pages.

Preparedness Gardening addresses how to create a garden, big or small, for the first time; how to supercharge soil health by using the power of “bio-mimicry” and microbiology; and what staple and nutrient crops to consider – all interwoven with a preparedness point of view and a minimalist approach.

These methods applied, you can have vital, rich food to provide for yourself through tough times and do it in a way that is organic and elegantly efficient. I believe this to be a part of a new local food renaissance that sees individuals, families, and communities take back far greater control of their food supply in the pursuit of security, independence, and health.

As preparedness aphorisms go, a year too early is better than a day too late, and this is especially true with gardening. You need all the time and experience you can get to grow well in your nook of the world. So, whether you are new to gardening or are looking to change your approach in the face of hard times, the information here will provide the framework you need get started as well as point you to some of the best resources out there to support your food preparedness.

Happy Gardening!

1

BREAKING GROUND

Breaking ground for the first time can be a thrilling process and impart a real feeling of accomplishing something meaningful with your hands. For small plots (say, less than 500 square feet), you have several methods available to you:

- 1) The most luxurious, bound-to-create-a-thriving-garden method is to create a multilayered sheet mulch, also regrettably referred to as “lasagna gardening.” There are different ways of doing this, but the idea is to smother what is growing, usually grass, with a thick compost-in-place and then grow directly out of it the following spring after the material has at least partially broken down and nature’s helpers have gently begun digesting and tilling in the materials. This can be as simple as cardboard with a layer of mulch or compost on top (a little dicey) or a complex, multilayered compost bed. Permaculture author Toby Hemenway outlines his ultimate sheet mulch as having first a thin layer of slashed vegetation, followed by soil amendments like rock powders, a thin layer of manure, newspaper or cardboard a half inch thick, more manure or nitrogenous material a half inch thick, 8-12 inches of stable bedding or other bulk organic matter, another inch or two of compost, and finally a couple inches of straw or leaves (87-90 *Gaia’s Garden*). It might go without saying that this is only suitable for very small spaces as the volume of material here is enormous.
- 2) Rotary tilling: Probably the most common on the home- and market scale, rotary tilling should prepare your garden bed as well as irritate the bejeezus out of you. It is crucial to note, though, that how many passes you must do to sufficiently till your ground depends on your ground and your tiller. A high quality walking tractor can handle just about anything but lesser models may not. My lowly tiller could not really

manage even a thick sod, or rocky ground, or dusty or hot conditions – in short, nothing other than already prepared garden soil in agreeable weather.

- 3) By shovel: Slower, yes, but the quality of the tilling is much better. Most grasses can be killed completely by flipping the sod upside down. This is also a resilient method of breaking ground in the sense that it requires nothing more than you (and hopefully some helpers) and a shovel(s). In about a week of irregular bouts of work, I broke roughly 3000 square feet of ground using this method two seasons ago with a helper for half of that time. The method is simply to bite off chunks of sod and flip them on their side or head, then move a step to the side and repeat. Leave them die upside down for a week or two, do more tilling and chopping if necessary, and rake the bed level.

It should be noted here that some intensive garden bed styles encourage a “double-digging” where you shovel two shovels down – roughly two feet – to deeply aerate and fluff the soil. Having spent a season using this method, I can confirm that it is feasible in a small space only because it is outlandishly labour intensive – and anyway not necessary as healthy soil biota together with smart cover cropping will aerate your soil, the latter of which is the goal of good soil management.



- 4) By chicken power: If you have chickens, you will already be perfectly familiar with their ability to turn an area into a patch of moon where nary a blade of grass or bug shall exist. They will turn sod into manure and eggs, have a good time doing it, and entertain you to boot. Some additional wood chips or other organic material tossed into the patch will lesson compaction, which the chickens will also do. After they have done their work, a cover crop can be planted to further build the soil for the next season; or you could feasibly plant a late season crop after some hoeing or tilling to loosen up the ground. How long it takes depends on the space, the ground, how many chickens you have, and what kind of chickens.

For larger garden spaces:

- 1) Tractor: on the homestead and farm scale, hiring someone with a tractor is a fast and easy way to break ground. From a resiliency standpoint, however, this option may not always be available as an annual practice.
- 2) Rotary tilling, as above
- 3) By shovel, as above, only now be prepared for grueling labour, *Moby Dick* on your audiobook playlist, body parts being sore, and probably doubting the whole affair at some point.
- 4) More animal power – chickens, as above, pigs & goats: Pigs or

goats are not very tenable for most of us, but it is a traditional method for preparing new ground worth mentioning. In his *Self-Sufficient Life & How to Live It*, John Seymour recommends pigs and goats for clearing land. He writes, “If you concentrate pigs in bush land, they will clear it for you with no effort on your part at all. They won’t, of course, remove trees, but all brambles, gorse, and undergrowth generally will yield to their snouts and they will manure the land at the same time.” Goats will achieve similar results (230).

2

SHAPING GROUND

While you break ground, you might also want to consider other earth-shaping techniques that optimize water availability:

SWALES

Swales are shallow trenches cut into the contour of sloping land that function to slow, sink, and spread water, which would otherwise rush over the surface without deeply penetrating the ground. Their size and depth ranges from 1-3 feet deep and 1-4 feet wide, with the resulting berm on the downslope about as wide, formed by the soil from the swale. The berm is typically planted with deep rooted perennials (berries, fruit trees, etc) that take advantage of the collected moisture there. Swales may not be as applicable to gardening annuals, but they are worth being aware of for your surrounding land. If your garden gets drowned by water that runs off an adjacent slope, for example, a swale would hugely improve the situation. Creating terraces with lips function similarly by allowing water to gather and sink before excess spills down to the next terrace.

RAISED OR SUNKEN BEDS

If your soil is especially shallow, say, much less than a foot deep, creating a raised bed may be an advisable option to provide plants with more root space. If you live in a rainy environment that tends to have wet, soggy soil, then a raised bed's extra drainage capacity would be helpful, too.

Sunken garden beds is a much lesser known method for retaining more moisture than a level or raised bed and are suitable for dry climates.

THE SHAPE OF YOUR GARDEN

More goes into this simple question than you might at first think. Permaculture authors often advise having unorthodox designs for gardens inspired by shapes found in nature such as spirals. Toby Hemenway outlines a herb spiral that takes 20-30 feet of linear row wound into a mound 3 feet high and 5 feet across. One places football- to fist-sized rocks on the mound in a spiral pattern from its bottom to its top, leaving about a foot's width for each tier. The mound has the added dynamics of having a somewhat cooler, shadier, and moister side opposite a somewhat hotter, sunnier, and drier side in which you can place the suitable herbs. Herbs like oregano and thyme can take the sunny side while parsley and chives can take the shady side. It sounds sensible enough if a bit ugly - just hope you do not have dogs, deer, homeless ant queens or hornets, that the aesthetics of a termite mound work for you, and that you do not actually live in a hot climate / are willing to water constantly. All of the above is what I would get. Just like a raised garden bed, a mound of soil in a hot climate will quickly become parched and hot away from the moderating effect of level ground.

Similarly, your garden bed can be made into a spiral or model the efficiency belonging to common branching patterns (the veins of a leaf, the lungs, a delta, the branches of a leafless tree, and so on). Considering such radically different designs is worth the thought if only to step back and really think about the purpose and function of the design of your garden.

A “keyhole” garden design is another space efficient design worth consideration. In this design, a single path leads to a central point where a radius of crops can be reached and tended to. Larger spaces add more keyholes extending out from the central space, or perhaps in other playful patterns like the branching pattern. Keyhole designs arguably allow for more plants, lessen footpath space, and may have an aesthetic appeal. Although I quite like the idea of a branching

garden, I find it impractical for anticipating the space given to any given crop, for crop rotations, and for ease of access; that is, I do not want to walk in a curve and take a corner just to get to my kale plant; a straight line will do nicely.

Raised garden beds are common to the “intensivist” gardening style. In this design a garden is divided into beds that are 3-5 feet wide (based on what your comfortable reach from the aisle is), often raised to maintain an un-stepped upon bed with well-aerated, deep soil for greater root space, and planted in a tight triangular pattern. Staggering plants from one row to the next is a simple trick that allows greater space for each plant in the same total space.

Central to the spiral herb patch, branching, keyhole, and intensivist garden designs is maximizing yield in a given space. The major caveat here, however, is available fertility. An overly crammed plot will produce unhealthy plants that are both nutrient and water stressed. So, if you plan to plant tightly, you must ensure your soil has ample fertility. Otherwise, plant wider to reduce or eliminate competition and allow for more nutrients and water per plant.

Finally, the rare author will advocate “extensive” spacing so that plants will have more nutrients and water available to them and, just as importantly, to provide ample space between plants/rows so that they can be weeded with a hoe easily and quickly. This human dimension to planning a garden bed is often overlooked. Tight spacing and lots of crops sounds good, but spending a season on your hands and knees weeding will quickly sour your experience.

PUTTING IT ALL TOGETHER

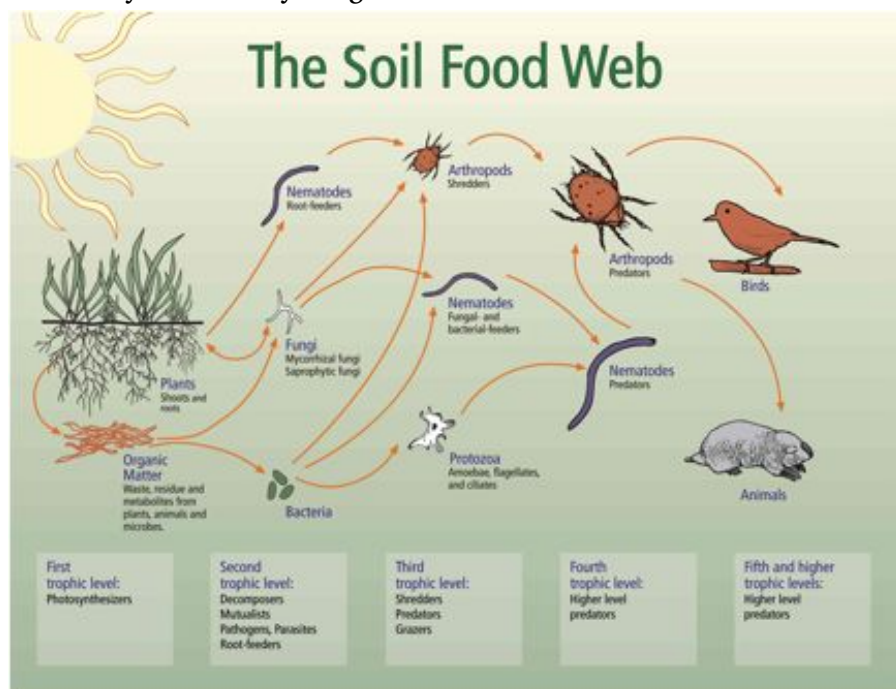
In his book *The Nourishing Homestead*, Ben Hewitt coins the term “practiculture” in his attempt to define his approach to homesteading. One of its meanings is of course practicality, but the very need to create such an unwieldy term reveals the overly ideological approach that is often evident in the gardening world, as in so many other spheres. Like Hewitt, I believe your garden design will do best when it reflects your gardening conditions – and that includes your own tastes and physical capacity – and probably not when blindly following a cookie-cutter design.

Our gardens, for example, are laid out in 4 foot wide beds, with aisles just a foot wide. This is a comfortable reach for me and is a better use of space than the common 3 foot wide bed. The beds are not raised beds because they are counter-productive in my hot and dry conditions. I plant spaciouly for the most part on account of new ground being poor in fertility and in water retention. Our small kitchen garden, which has received much more fertility, I plant a little tighter and in narrower beds.

3

BUILDING GROUND & THE SOIL FOODWEB

The soil foodweb, a term coined by microbiologist Dr. Elaine Ingham, refers to the enormous variety of soil organisms – “microherds” – in healthy soil, including fungi. They are the lifeblood of the soil and give it all its desired characteristics. They break organic matter down into humus and plant-available nutrients; optimize soil structure with their biotic glues, creating a crumbly, fluffy, aerated soil that permits rapid water absorption and increased water holding capacity; they interact with plant roots, trading nutrients for sugars as well as offering up their wastes; keep soil pathogens in check; even secrete antibiotics that protects plants from disease, and so much more. More simply put, they are the middlemen between the nutrients (and potential nutrients) in the soil and your plants and are therefore absolutely crucial to your garden’s health.



Ingham makes the paradigm-busting, fantastically hopeful and radical argument that whatever soil you have has all the latent nutrients you

will ever need, ever, and so you need not add any amendments to your ground; what is actually lacking is the soil biology that extracts minerals from the parent rock material, organic material, and the air and makes them available to plants. This bold claim has been demonstrated, for example, in the millions of acres that she has overseen and in trials run by the Natural Resources Conservation Service (NRCS) where focus on soil biology together with the symbiotic action of plant roots has consistently enriched soils without any fertilizer amendments, allowing for top-tier harvests. This doesn't happen overnight, though, and so we need both a short- and long-term approach to building our soil. Well, how long does it take? Ingham has stated that if you make excellent compost replete with all that soil biology, you can see a holistic turn-around in one year, while many other issues (eg, compacted soil) can be corrected within days.

In the short-term, then, if you have degraded soil or are just starting up, you need an organic fertilizer and/or compost application(s) so that you can grow food right away.

FERTILIZING & AMENDING SOIL

To jumpstart or optimize our nutrient levels we need a healthy soil biology and the right soil amendments. We are looking for the right amounts of macronutrients – nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sulphur (S) as well as carbon (C), hydrogen (H), and oxygen (O) – together with micronutrients, or trace minerals – boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), zinc (Zn), molybdenum (Mo), and nickel (Ni), and dozens of others.

How do we know what nutrients are presently available to plants? Some of the most respected organic growers and authors dismiss soil testing because different labs provide different results and because apparent results are often not reflected in the fields. It turns out that nearly all soil testing labs identify soil nutrients with strong chemical processes not at all representative of the processes of a plant root, making the results biologically irrelevant. Plant roots release weak carbonic acids to help extract nutrients from the soil, and so a biologically, functionally relevant test must imitate this process. Labs that do test using these guidelines are significantly based on the research of Dr. William Albrecht and Dr. Carey Reams, which will work as search terms for you to find such a reputable lab near you. The NRCS discovered the same disjunction between standard soil testing and the apparent health of crops and Dr. Rick Haney responded by developing his own test, The Haney Soil Health Test. So, one very precise route to take would be to have one of these labs determine what your soil needs and offer tailored advice for organic amendments.

But what if these soil tests are not available to you or are unaffordable? Then you let the plants and the kinds of weeds show you what's missing. I am partial to this style of discovery, which seems more self-empowering and self-reliant if perhaps less precise. Charles Walters in *Fertility from the Ocean Deep* puts it this way: "It

will undoubtedly be a requirements for farmers to know as much about the soil as they do about the science of agriculture. He or she will have to let the soil tell what is right as well as what is wrong, the way an old-time physician looked to signs and symptoms rather than laboratory results.” It goes without saying that you need thorough resources that detail the traits of nutrient imbalances, and, related to that, you need to know the particular needs of each type of crop. Some life-long homesteaders like William Bonsall have all but never tested their soil and have simply relied upon observation, copious composting, and regular application of minerals to replace and improve soil nutrient levels.

WORKING WITH TREES

Bonsall is not alone in claiming that trees and their leaves are ideal for building soil fertility. “If our goal is adequate nitrogen contained in lots of humus,” he writes, “tree leaves are hard to beat” (44 *Will Bonsall’s Essential Guide*). Tree leaves also contain ample amounts of phosphorus and a wide range of minerals. Rock-star organic gardener Eliot Coleman once ran an experiment with his cabbage where he incorporated cow manure on one bed and lots of leaves on another. The manure plot grew to be infested with disease and the leaves plot produced a healthy cabbage crop. His observations have been since reflected in his recent books for tilling in leaves for cabbage family plants in particular.

Tilling as an annual practice is not recommended, as we will shortly see; composting leaves is the ideal way of incorporating them into your ground, and they are also an ideal mulch so long as they are shredded or not over applied, which may result in a thick, breathless mat.

Ashes are also rich in minerals in roughly the same proportions that other plants need them. These minerals are “mined” in a terrifically sustainable way from bedrock material by tree roots. Ashes include significant amounts of potassium, making up about 10% of ash’s total mass, and calcium, making up 25-45%. That’s a huge figure. Looking at this topic from another angle, Doctors Joel Wallach, Ma Lan, and Gerhard Schrauzer in their opus *Epigenetics* observe that people had used plant minerals in the form of wood ashes in their gardens since the beginning of time. Then, at 3:00 PM, Monday September 4, 1882, that changed: Thomas Edison had pulled the switch on the first commercial electric generating plant in the world. The replacement of wood as a source of fuel for cooking and heating with electricity eliminated families’ traditional source of dietary minerals found in wood ashes and resulted in the decline of the general health of industrialized cultures (119-120). Ashes are alkaline, however. This

will help if our soil is acidic, but could be dangerous if our soil is already neutral or alkaline. One source recommends no more than 10lbs of ashes per 1000 square feet. Personally, although we heat with wood, we just do not get any serious volume of ashes and so they get lightly spread in rotation (say, with legumes or brassicas that especially appreciate the ashes). Another round about way of getting the minerals from ashes into your garden beds is to supply them from every few years to the areas that you take from for your compost – a hay field or patch of alfalfa, for example.

This approach of utilizing trees is especially worthy in a preparedness context as most of us have access to them and their leaves, whereas many other soil amendments are dependent upon third parties and often complex industrial processes.

OTHER ORGANIC FERTILIZERS

There are numerous other natural soil amendments for us to consider when we have an idea of what our soil needs. In normal times, most of these should be available at your local garden store. What about in abnormal times when for some reason you cannot get your hands on anything? Besides tree leaves, ashes, and grasses and greens you might use for compost, here are some other materials that may be freely available:

- Your pee – human urine has an Nitrogen-Phosphorus-Potassium (NPK) of about 15-2-2. That's a very high amount of nitrogen, which is why you have to dilute it before you apply to any plants something like 10 parts water to 1 part pee. Obviously, best not go spraying your salad greens with pee, but most plants that require a shot of nitrogen will thank you for it. Because the nitrogen is so soluble, space required applications a week or two apart.
- Animal manures – NPK ranges vary. Preferably composted.
- Filleted fish or the like (about 10-6-2) – I watched a clip on youtube of how a guy grows the biggest cabbages in Alaska, which he does by laying several spent salmon fillets around the young plant and covers them with soil. He could *hear* the plant grow.
- Human hair (18-0-0) – A very concentrated source of nitrogen but which releases slowly over a year or two. I snagged bags of this for free from my hairdresser and incorporated it last fall – results still pending. Spreading hair from dozens of people is as unsettling as you might think.



- Seaweed (0.4-0-0 + trace minerals)
- Alfalfa meal (2-1-3)
- Blood meal (12-0-0) – A potent fertilizer that will release over 1-4 months. May attract animals.

TRACE MINERAL PRODUCTS & OTHER AMENDMENTS

Here are some trace mineral products and other amendments that will help build soil and plant health in the short- and long-term.

ROCK DUST

Remineralizing soil by way of adding glacial rock dust is similar to the Earth's own process of creating nutrient rich ground: during ice ages, hulking ice sheets crushed collected rock into powder upon the surface of the earth and volcanoes disgorged minerals from deep within the earth to settle over the land. Remineralize the Earth, an organization that focuses on this topic, notes the following impressive benefits from using rock dust:

- Provides slow, natural release of elements and trace minerals
- Increases the nutrient intake of plants
- Increases yields (up to 200% in some cases) and gives higher brix readings
- Rebalances soil pH
- Increase earthworm activity and the growth of microorganisms
- Builds humus complex
- Prevents soil erosion
- Increase the storage capacity of the soil [cation exchange capacity]
- Increase resistance to insects, disease, frost, and drought
- Produces more nutritious crops
- Enhances flavour in crops
- Decrease dependence on fertilizers, pesticides, and herbicides

Application on the home-scale is best when combined with your compost where the dust's minerals are assimilated into the compost's complex biological system. Remineralize the Earth suggests 15-20lbs per cubic yard of compost, or generally between 150-450lbs per 1,000 square feet of garden space.

SEA MINERALS

Condensed, often desalinated sea water is another high powered product for providing a full range of trace minerals. Unlike products that need healthy soil biology to process minerals, sea minerals are readily available to plants, which is why it is also used in hydroponics. Its bio-availability makes it a highly recommended product for anyone in the process of recovering poor soil. Measured benefits include:

- Higher brix ratings (even after just one application) / increased nutrient density
- Shortened growing cycle
- Average crop yield increase of 15-35%
- Improved resiliency to cold, drought, disease, pests, and overwatering
- Improved soil tilth
- Reduced need for fertilizer inputs

An obvious concern is whether a sea water product is clean enough, especially if it is extracted from the Pacific Ocean with Fukushima's ruined nuclear power plant forever gifting the sea with its radioactive poison. I contacted the corporate director of the sea mineral supplier Agrarian Organics with this question, and he informed me that they "always draw deep ocean water far below where radioactivity would migrate at [sic]." He also presented the latest contamination findings from a third party, which showed that contamination levels were extremely low. He may be a biased source but, indeed, academic, government, non-governmental organizations, and citizen scientists that continually monitor and test the waters and animals in the Pacific have found contamination levels to be extremely low – much lower than naturally occurring radioactive isotopes. FukushimaInform is one reputable organization of scientists and researchers monitoring the situation and that clearly and continually relays the hard science. It may be that at some point, if there are many years of continued accretion, the contamination will be more serious, but for the time

being ocean water products like sea minerals appear safe for use.

Application rates are 2-4% water solution applied at least twice per growing cycle.

BIOCHAR

A short- and very long-term product, biochar is a little known and exciting amendment to soils with a plethora of functions. Some use the word slightly differently, defining it as simply char that is intended for agricultural practices; others say for biochar to be *bio*char it has to be biologically charged. In any case, what makes char such an incredible soil amendment is its slightly negative electrical charge and its physical structure.

Its slight charge acts like a magnet for positively charged minerals, which make up the majority of soil minerals. The better your soil can hold onto nutrients that are root available while not being leachable the more fertility it can hold onto, the less fertilizer you have to apply, and the better the whole soil life will be. A positively charged mineral in the soil is called a cation (*CAT-eye-on*), and a soil's capacity to hold onto positively charged minerals is called its cation exchange capacity (CEC). Soil scientist Jon Nilsson of Living Web Farms explains that your CEC is like the soil's bank account. The bigger it is, the more nutrient riches it can hold. Biochar's tremendous capacity in this regard can be a problem, however, if the biochar is used without sufficiently charging it first. Like a carbon-based water filter, at first the char will suck up nutrients, making them less available to plants, but when the char is sufficiently charged it acts as this bank account from which plants and soil biology continually draw nutrients.



The famously rich Amazonian soils known as *terra preta* were created by many generations of people throwing together char and various wastes (including humanure), resulting in extremely fertile soil that remains to this day. The recalcitrant nature of the char (it breaks down only over thousands of years) means that it keeps functioning year after year. And, so, whereas common poor soils in the southern States have a CEC value of around 4, and really good land might have a value of 10-15, the *terra preta* soils presently have a whopping value of 222! The American grasslands were managed by Native Americans through burning, and recent tests there too show that nearly all of the present CEC of these soils is due to the biochar present in the soil.

Char's structure is its other magic trick. A gram of char has a surface area of two tennis courts, creating an incredible amount of surface area upon which microorganisms and fungi can house themselves. By providing this architecture for soil biology, biochar seems to provide a positive feedback loop, inviting more and more biology in and thereby creating more and more benefits to the soil. [Image credit: pacificbiochar.com]



You are lucky if there is a good compost that includes biochar available at your local garden center. If, like me, there is no such thing around you, it's time to enter the vast youtube library of char-making videos. I have used the double-barrel method but I find it is not very forgiving when you don't have a lot of small woody materials to burn. And if the wood doesn't burn well, it produces an unreal volume of smoke. Next season I look forward to trying the Japanese-inspired open, conical burn method. Doing it on a small scale, most people have trouble with the char-crushing part of the process, myself included. I use an old splitting axe to crush a thin layer of char in a pail; I wet it down periodically to keep the dust down, and when it is crushed enough, I transfer it to another pail. If you try to crush too thick of a layer at once, you get a crushed layer atop a nicely un-crushed one. It's tedious and dirty work, but the biochar is worth it.

How do you charge char? The most basic method is to mix or soak it with something nutrient rich. I have done this with chicken manure and let it sit for most of the winter, and the finished product worked great. Peeing in your char is another easy option to capture otherwise lost nutrients. You can get fancier by inoculating the char with both nutrients and microbial life, for which there are many options. For instance, I have seen flour and cut grass used as microorganism food mixed in with char, which is then left to brew for a week or two.

The best inoculating method by far, however, is incorporating it into your compost pile. There, it will become saturated with biology and acquire a full nutrient load from the compost materials. Having its CEC, char also maximizes nutrient retention in the pile, reportedly capturing a whopping 50-75% of the nitrogen belonging to the pile – far more than the few percent normally left after off gassing and leaching. This presents an incredible improvement in the fertility of your compost.

With respect to crop benefits, Virginia Tech found, over four years of biochar trials, that just 3% biochar by volume in tomatoes' potting soil increased yield by 51% at first pick, with yield then leveling off as the seasons progressed. A home gardener study led by Dr. Cecile Girardin (thebigbiocharexperiment.co.uk) found overwhelmingly positive results for common crops with a few exceptions. Overall yield increase was 15% but with some crops reaching a 70% increase. There are plenty of other trials and anecdotes out there to entice you. My own limited experience so far confirms biochar's powerful action in the soil. For all of the above benefits and its essentially permanent action in soils, biochar is an incredibly promising amendment and can play an important role in a garden designed around preparedness and resiliency.

If you cannot apply it as part of your compost, a small application of properly charged biochar within the planting row will do the trick.

PRACTICES THAT PROTECT AND BUILD YOUR SOIL FOR THE LONG-TERM

I became attracted to gardening for preparedness after learning just how outsourced and vulnerable my food supply was. Here in Canada, we import 75% of our food from elsewhere, exposing us to an obscene counter-party risk. An earthquake in California means a food crisis up here, thousands of miles away. In my neck of the woods in the Kootenays of British Columbia, we supply just 5% of our own food. These figures present definite systemic weaknesses. One of these weaknesses is playing out now as I write where the falling Canadian dollar is seeing the prices of our US imported foods sharply rise.

Soon after realizing I should be more prepared, I purchased Matthew Stein's *When Technology Fails*. It is an excellent resource for a huge array of preparedness considerations. For growing food, Stein points to the Grow BioIntensive method of gardening, which I then pursued with the book *How to Grow More Vegetables* by Grow BioIntensive's lead developer, John Jeavons.



I found that such an “intensivist” method, however, is not suited to preparedness despite claims of growing more in less space and with less water. Gardening in a preparedness context naturally means planning for things like power outages and disruptions to the availability of goods. In the Grow BioIntensive method, we found ourselves watering daily – as Jeavons recommends – because there was no other option with raised beds, bare soil, and crowded plants. It was also a lot of work hand-weeding, which is necessary because the spacing is so tight you cannot use a hoe, and double-digging (preparing the garden beds by digging the whole garden two feet deep). It may be that this system provides great yields, but for preparedness I wanted a more elegant approach that was not so fragile nor so labour intensive.

Since then I have explored different methods with the goal of developing a resilient garden. I believe that means being able to rely upon locally available materials to build fertility; and nourishing the life in the soil in order to create the marvelous “black cottage cheese” soil that we’re after. That soil is anti-fragile, possessing the resilient qualities of optimal water-holding and infiltration capacity and enduring fertility. Building this ground has been the mission of the soil scientists at the Natural Resources Conservation Service.

THE NRCS PRINCIPLES OF BUILDING SOIL HEALTH

The NRCS approach is built around nourishing the soil foodweb, and it is achieved by farming and gardening in “nature’s image,” also known as “biomimicry.” Their simple yet revolutionary methodology is encapsulated in five principles. According to Ray Archuleta, one of the NRCS’s most visible speakers, these principles are universal, but there are many ways to employ them as dictated by your context. The five principles are:

1. Limit Soil Disturbance
2. Keep an Armour on the Soil
3. Grow a Diversity of Cover Crops
4. Keep a Living Root in the Soil for as Long as Possible
5. Exercise Animal Impact or Apply Compost

1) LIMIT SOIL DISTURBANCE

Tillage and excessive animal grazing destroy the soil life that is at the heart of our project. Mechanical tillage physically destroys the structure of the soil and floods the ground with oxygen. This influx causes a short flourish of opportunistic bacteria that gobble up organic matter, releasing a flush of nutrients in the short-term. An example of this is tilling in a green manure. Archuleta equates this with “burning the house down to heat a hotdog” because it quickly destroys the organic matter in the soil, resulting in a crash in soil life and a deterioration of good soil qualities.

There are some exceptions to the rule, though. If you are starting a very small garden, you could prepare it with a sheet mulch; but a larger garden will require serious disturbance by animal, machine, or shovel. Very poor soil may also benefit from a one-time tilling in of organic matter or other amendments too. I have done this to my new and poor soils to jumpstart fertility. Some growers do occasional tilling, which basically holds this principle. For instance, an excellent garlic farm near here tills every third year as a part of their rotations.

How will nutrients get to the root zone without tilling? Your soil life and worms will do it for you. Typical earthworm populations readily consume two tonnes of dry organic matter per acre per year, bringing it down into the ground with numerous fertility benefits.

2) ARMOUR ON THE SOIL

This advises us to keep the soil covered with organic matter, imitating what we see on a forest floor or grassy plain. We home gardeners can do this with mulches of shredded leaves or straw, for example, as well as with terminated cover crops. Keeping an armour on the soil benefits the soil foodweb by moderating soil temperature and moisture levels; by being a primary food source that gets slowly digested into humus and liberated minerals; and by protecting the soil from rain impact and heavy downpours. A mulch also helps retain ammonia (nitrogen), and it greatly reduces weeding. How thick should your mulch be? Recommendations vary a great deal, but a good rule of thumb is a few inches.

To produce this armour with cover crops, you can either plant a winter-kill cover crop or terminate the cover yourself. The latter is accomplished by rolling over the cover at the right time or by chopping it down. Farmers roll down covers with a crimper attachment that breaks the cover crop stems in several places at once, flattening them completely into a green carpet. Ray Archuleta demonstrated this principle on the home-scale by using his daughter's car to drive over a tall stand of cover crops and, alternately, using a riding mower to flatten the stand together with a make-shift roller in tow. The key is in knowing when this action will terminate the cover crop. Grasses (like rye, wheat, and barley) can be terminated by rolling them at flowering stage; the same is true for vetch. Most tender plants (like buckwheat and fava beans) can be rolled at any time. For the hangers-on, you can chop them down with a scythe, mower, whipper-snipper / weed-whacker, or the like. The advantage of rolling or flattening down a cover rather than chopping it down is

that you can lay it down in a single direction, making subsequent work (like planting in rows) more manageable.

3) DIVERSITY OF COVER CROPS

Plants secrete exudates from their roots, composed mostly of sugars, and these exudates chemically differ between plant species. The more diversity of roots we have in our cover crop, the more “balanced the diet” is for the microorganisms. Different plant roots also have unique effects upon the soil like fixing nitrogen, collecting specific nutrients (“nutrient accumulators”), eliminating or rebalancing soil pathogens, and so on. Different root systems have different physical actions as well. Some deeply loosen the soil, like tiller radishes, and some add an enormous volume of organic matter through their extensive roots, like rye. We can combine all these benefits by planting a diversity of cover crops simultaneously.

Having a variety of cover crops will also help balance the carbon-to-nitrogen ratio of the terminated plant material. If your cover crops are too carbon heavy, their debris will be too slow to break down and result in excessive pile-up; if they are too nitrogen heavy, they will be consumed too quickly and leave the soil unguarded and deprived of organic material. The right ratio is somewhere around 20 parts carbon to 1 part nitrogen (not that much different than your compost pile), but trial and error will probably be how you figure out the right balance that sees the debris consumed at the right pace.

NRCS recommends using plants from four broad categories for your cover crop mixes:

- Cool Season Grasses such as rye, wheat, barley
- Warm Season Grasses such as sorghum (Sudan grass)
- Cool Season Broadleaves such as fava beans, winter peas, hairy vetch
- Warm Season Broadleaves such as sunflowers, buckwheat, cow peas

A great free cover crop resource is *Sustainable Agriculture Research &*

Education at sare.org. They have extensive profiles on all your major cover crops.



4) KEEP A LIVING ROOT IN THE GROUND AS LONG AS POSSIBLE

Because of all the beneficial effects of an active root zone, cover crops should come tightly before and/or after our food crops. To confuse that point a little, one can also undersow a cover crop, where a cover is planted about five weeks after a food crop has been established to maximize the cover's growing time. Master gardener and salad fiend Eliot Coleman explains in *The New Organic Grower* that planting a cover after his food crop is not much of an option because of the short duration of his season, and taking a field out of production altogether with a main season cover crop hurts his wallet, and so undersowing is his solution. It works for him. Personally, I have found undersowing mostly insufficient for establishing enough cover to really move soil health in the right direction. Take, for instance, a bed with three rows of carrots in it; sowing a few rows of cover crop in between these rows works out to be a rather thin application.

To illustrate how cover cropping scheduling can work, here's an example of what we do with our potato beds: after early potatoes are harvested, I have planted a mix of buckwheat, barely, pea, and fava

(partly pictured above) as a mostly winter-kill cover crop. This grows to about two feet in height before cool temperatures slow it down. In mid October, we plant garlic cloves right into the green cover. Come spring, the cover has become a thin mulch through which the garlic easily emerges.

After the the late potato beds are cleared out, a mix of rye, vetch, and winter peas has enough time to become established before winter locks up the earth. When the rye reaches flowering stage the following spring, it gets rolled down along with anything else that has survived in preparation for a bed of roots. This, by the way, is vastly easier than tilling or double digging!

An exciting cover cropping example pertaining to potatoes from Virginia Tech that I have not yet tried works like this: a cover crop of rye and vetch is established in early Oct; around May 6 this tall cover is knocked over at the same time as potatoes are planted 5” deep; 2.5-3 weeks later, the residue is flailed close to the surface to kill anything else still growing just as potatoes are emerging. And that’s it. No exhausting hilling or other soil disturbance, and with this their yield is 17% over the conventional average.

5) ANIMAL IMPACT / COMPOSTING

Still another aspect of farming in nature’s image is imitating animal impact. Although grazing patterns may not apply to many of us gardeners, it is illuminating to know that places like the plains of North America possess such fertility largely because of high-density, short-duration grazing by colossal herds of animals. Nature’s style of grazing is consequently called “mob grazing” and is roundly praised for its benefits to the soil, the pasture, and the animals. When tall grasses are mob-grazed, some are crushed under hoof, and others are eaten down to within a foot of the ground, but not all the way down, which would harm the plant’s ability to regrow. Plant roots respond with a flush of exudates, resulting in increased microbial activity and

nutrient exchange. The ground above is manured, which returns fertility and adds and more biology. The grasses regrow, sequestering more carbon from the atmosphere as they rebuild themselves. In this way, nature sequesters carbon, builds soil, and primes the soil foodweb to unlock more minerals. On the other hand, animals that are lightly stocked and never rotated will slowly destroy the pasture. We have all seen examples of cows or sheep picking through short grasses growing in patches in a punished field.

A gardener or homesteader can, however, more easily use chickens for beneficial animal impact. The well-known “chicken-tractor” is one such method where chickens are confined to a small cage that gets moved over a pasture or cover crop in a mob-grazing style. Chickens also can clean and manure a space before a cover crop, terminate certain covers, or dice a cover to bits after it has been terminated in some other way. They are amazing garden helpers. This spring, my chickens have (without any direction from me) executed the latter example, completely tilling in a winter-killed cover crop while adding their droppings.

COMPOST

I suspect NRCS includes compost under the animal impact principle because of certain similarities to manure. As discussed above, our compost is the ideal vehicle for our fertility input. Its nutrients are derived from whatever materials we have made the pile with (like leaves, green materials, wood chips, manures, food wastes) or have supplemented into the pile (like rock or mineral powders). However, through the work of Elaine Ingham and others, we know that good compost also functions as a biological inoculant that optimizes our soil biology. As a result, a functioning soil foodweb will begin extracting nutrients from the parent material for us and we no longer need to worry about adding particular mineral amendments – no rock dust, sea minerals, calcium products, rock phosphate, greensand, or what have you. In the preparedness context, I think Ingham’s insight is

critical. We need to know that we can grow nutrient-dense food and improve soil fertility even when nothing is shipping or when prices are prohibitive. In such a scenario, we only need access to organic materials to compost.

So, then, how do you create a compost pile that contains all the right biology and correct balance of that biology? I cannot state it any better than Ingham does on her website, soilfoodweb.com, under the “thermal compost.” Her presentation is refreshingly simple and her authority and rigorous testing of results lends a lot of confidence to her recommendations. She also makes reference to piles becoming so hot that they burst into flames. Now, that would be foolish mismanagement, but if it happens to you, upload that action to youtube immediately.

Compost is finished when it has broken down fully and its temperature has returned to ambient temperature. Ingham’s system takes about 6-8 weeks to produce finished compost. There are lots of options for how to apply it. In order to prevent heavy disturbance, compost is best spread with or without some shallow stirring. We can part our mulch and stir it into our intended crop rows, for example; or we can apply it before mulching or cover crop termination; or even before cover crop establishment. How much to apply varies and depends upon what you are growing and how good or bad your soil is. According to Toby Hemenway, author of *Gaia’s Garden*, a few inches of compost ought to make even poor ground supportive of dense plantings while the gardener sets in motion long-term soil building practices.

A RESILIENT SOIL – DRY GARDENING IF TIMES GET REALLY BAD

It was not all that long ago that the vast majority of gardeners did not have the luxury of easy-access watering. Before 1930, few farms had electricity, and it would be a fair guess that over 90% of all gardens before 1882 (when Thomas Edison fired up the first commercial electric generating plant in the world) were grown without running water. In some places, it is hardly an issue. My grandmother has never needed to water her garden because she enjoys the rain-forest summers of east Ontario. Likewise, many gardening authors in England or the east of North America seldom bring attention to watering because water is not a pressing issue in their rainy worlds.

If you live in such a place and are wondering how to garden in the event of a serious power outage that stops irrigation dead in its tracks, you will not have much trouble: wide plant spacing. More space per plant means more water available to its root system. All things being equal, most or all of your crops in such rainy places can do very well with the security of extra space. My grandmother can attest to this. You may also find that your plants thrive with the extra space and available nutrients.

Other factors that support dry-gardening in rainier places is having deep ground, clayey and silty soil, soil having lots of sponge-like organic matter, and, of course, keeping that armour on the soil and supporting the soil foodweb. Naturally, plant types vary in how drought resistant they are. For example, bulb onions, celery, and lettuces tend to need plenty of moisture; squash, melons, and indeterminate tomatoes fair well with less moisture; beets, chard, kale, leeks, rutabagas, and giant kohlrabi are good at scrounging for water and are relatively drought resistant; and potatoes do superbly well in dry conditions, growing more flavourful, more nutritionally dense tubers (135 Deppe). Seed type also matters. Author Carol Deppe

notes that heirloom varieties, “grown in rows with traditional wide spacings, can be grown in most regions of the world without irrigation” (137). Hybrid varieties are likely to have been developed in more ideal conditions and certainly not selected for drought resistance.

So, in a relatively rainy place, say, east of 98W longitude in North America, you can develop water resilience by widening spacings, building soil, mulching, and using suitable plant varieties. Dry gardening in a drier place, most places West of 98W, is a much more challenging affair:

In my brown land, we have weeks and months without rain. It almost seems like without an army of firemen, the west of North America would be reduced to ashes in its hot, dry summers. Here, we can look for help from Mediterranean gardening, permaculture, and the techniques of farmers of the dry lands and deserts of North America, the Middle East, and Africa as presented in Gary Nabhan’s book *Growing Food in a Hotter, Drier Land*.

SOIL

The type of soil, quantity of organic matter, and good soil structure are the most important components of dry gardening. With respect to type of soil, perhaps the most telling anecdote given by Gary Nabhan in his dry farming book is from what may be the hottest and driest place in North America that has ever developed food – on the Pinacate volcanic shield of Mexico's Gran Desierto. Air temperatures during the summer he visited hovered around 46C (114F), and farmers there started planting with the first summer rains, after which only two more rains fell. Much of that rain, however, stayed in their silty-loam field well enough to bring to maturity crops of corn, beans, and squash (93).

Organic matter also holds a key position because its ability to retain (and accept) moisture. Just one percent of organic matter in topsoil can retain about 33 pounds of water per cubic meter. At five percent, that figure goes up to 195 pounds (112). This huge bank account of water naturally provides a superb buffer for the gardener that faces a shortage of irrigation. Our organic matter levels and soil structure will rapidly improve by using the soil building techniques discussed above.

EARTHWORKS – FREDGES, SWALES, TERRACES, RAISED/SUNKEN BEDS

Traditional farmers living in very dry areas, often situated below a slope or in a gulley of some kind, receive seasonal floods that wash down and over their plots, bringing water along with silt and various kinds of organic detritus. If floods are heavy, branch screens (or the like) are erected near the edge of the field to filter and slow the gushes. Nabhan refers to this construction by a word of his own design – a “fledge,” an unholy mashing of “fence,” “hedge,” and “row.” In this way, their plots annually build or replace silt, organic matter, and nutrients (minerals, washed down animal droppings).

Being situated at the base of a desert mountain seems a rare place for the average homesteader. Fortunately, other earthworks are more widely applicable. Swales, as mentioned above, are popular in permaculture and are a simple and effective way to slow, spread, and sink water moving down a gradient. Creating terraces with lips function similarly by allowing water to gather and sink before excess spills down to the next terrace. Sunken beds will also collect and hold more moisture and is another traditional desert-gardening technique.

PLANT VARIETY & THE GREAT DRY GARDENING POTATO EXPERIMENT

Plant variety is an obvious consideration if you are planning for serious dry gardening. Some examples of drought tolerant staple crops include certain varieties of corn (as evidenced above), certain beans (e.g. tepary beans and cowpeas), winter squash is a good water scavenger, and potatoes do great in dry conditions (but not necessarily scorching conditions).

Where I live, we get about three months of drought along with oppressive heat. Two summers ago, we clocked six weeks of 36-42C (97-108F). In newly dug ground, which is silty (and rocky), I ran my first significant dry-gardening experiment with potatoes. I grew nine varieties of potatoes over a 5000 or so square foot space on very wide spacings – 4' between rows and 18-24" between plants – with zero additional irrigation. Inspired by other West Coast authors to do this, I soon realized that they have coastal temperatures and not desert heat. Nonetheless, early varieties fared excellently with spring rains that petered out in June, and about two-thirds of the other varieties did either passably well or very well in the scorching, dry heat. It seemed like the varieties that really suffered did so because of the heat more than the lack of water. Over time, I will select for varieties that do tolerate the heat better. It is empowering to know that perhaps the ideal staple crop – potatoes – can be grown with no additional irrigation in a climate as hot and dry as my own. Although the yields are less without irrigation, the tubers are more dense, more nutritionally compact, and more flavourful.



What varieties did best? Heirloom variety Rode Eerstelling, Roko, and early varieties Pacific Russet and Linzer Delikatess did best, the latter two more perhaps because they made good use of a rainy June. Yukon Gold did passably well, and French Fingerling, Banana Fingerling, Burbank Russet, and German Butterball all did poorly to some degree. Alas, the best tasting for us is the gourmet French Fingerlings, and so I am determined to select for hardier plants while building the soil.

SHADE & MULCH

In really hot climates, it goes without saying that providing some shade will reduce heat stress to vulnerable plants. It also reduces moisture loss from the soil, a widely discussed subject. Mulch is vital as well to protect the soil foodweb together with conserving moisture.

OTHER DRY-GARDENING ODDITIES (& FAILS)

As a dry gardening tactic West Coast gardening author, Steve Solomon, suggests “fertigating” crops (fertilize + irrigate) where water and nutrients (like urine, watered down manure, or fish emulsion) are delivered right to the root zone or base of the plant with a leaky pail or the like. Gary Nabhan discusses similar spot-treatment methods used in far-flung desert areas by burying clay pots next to plants and filling them with water. The water slowly seeps out of the clay pots and the efficiency of water delivery is very high. After spending a brief chapter discussing clay pot irrigation, Nabhan undermines most applications by stating at the end of the chapter that “Few vegetables (and virtually no grains) accommodate the spacing it requires” (90).

I found Solomon’s fertigation with a leaky pail equally useless. The volumes of water suggested are about as much as using a sprinkler, for one; and second, it is very impractical to do for more than a few plants. It is one of those strange examples of something that sounds neat on paper that turns out to be absurd when you test it out. It is doable for your grape vine or apple tree, but not for anything else. I tried with a row of cabbage and about 20 tomato plants a couple seasons ago – again, you may as well just use a sprinkler if things are functioning normally. If things are not functioning normally and you don’t have running water, there is no way you can water your garden with hundreds of five-gallon pails of water that you would have to haul from somewhere.

Drip irrigation delivers water to the root zone very efficiently and will certainly conserve water. We need to be cautious, though, of the fact that because drip irrigation does not water the soil surface it may not be supportive of our efforts to proliferate soil life. I use drip irrigation for our berries, which works wonderfully, with a ground cover to protect the soil.

Hopefully this brief discussion helps you with some ideas for creating a more water-wise garden that can better handle disruptions to your irrigation.

4 YOUR STAPLES

Gardening for tomatoes and salad will not cut it in a food crisis. Growing for food preparedness means growing staples – foods that provide significant calories and macronutrients. Some traditional-diet inspired staple garden crops that will help you cope with food price and/or availability issues include potatoes, squash, grains, roots, and fermentable vegetables. Eggs are so important that they need to be squeezed into the home-scale preparedness mix too.

Which staples we emphasize all depends on what you like and what your growing conditions are like. For example, potatoes are the most calorie-productive crop, yielding 100lbs per 100 square feet in the toughest conditions and up to 700lbs in the same space in ideal conditions (143 Jeavons) with about 350 calories per pound. They are relatively easy to grow and harvest but can be challenging to culture by hand, especially if you have rough land. They are a good option if you don't have all that much space.

But grains have other advantages if you do have lots of space. For one, they are a breeze to grow. Old varieties in particular do best in poor soils – clearly, that is a huge advantage over a nutrient hog like potatoes. They require no culturing or tending through the season; and they store for years if kept well. On the downside, they yield less and are somewhat tedious to harvest. In addition to basic logistics like that, we cannot overlook taste. That seems obvious to point out, but I and gardening friends of mine have more than once made the mistake of growing a lot of a crop that we don't particularly like. This is true of squash for me, however good homegrown squash is compared to the store-bought stuff.

A NOTE ON THE TRADITIONAL DIET

Looking at diet from the point of view of what you and your community can grow and raise greatly simplifies the enormous noise and confusion over optimal diets in public discourse these days. Clearly, a diet dependent upon industrial food production falls away immediately. Interestingly, a paleo diet – the popular diet that aims to approximate the human hunter-gatherer fare – is not likely to be agreeable or sustainable if it has to be personally executed: being constantly engaged in hunting and foraging would be a time-consuming, exhausting, and tenuous way of trying to feed yourself entirely. Humans developed and maintained agriculture because it offered the benefits of greater food security while also permitting the conditions for more complex societies and cultures to develop.

What you and your community can grow and raise and what humans around the world have eaten for thousands of years has is called a traditional diet. The outline of a traditional diet was recorded by Dr. Weston A. Price, a prominent American dentist of the early 1900s who travelled for years to remote parts of the world to study the health of peoples untouched by industrial food production, eventually resulting in his classic work, *Nutrition and Physical Degeneration*.

Price documented 14 isolated traditional peoples living entirely on local foods from Switzerland, Ireland, indigenous peoples of North and South America, Melanesian and Polynesian South Sea Islanders, African tribes, Australian Aborigines, and New Zealand Maori (117-118 Wallach). Incredibly, wherever Price went he found that “almost every member of the tribe or village enjoyed superb health. They were free of chronic disease, dental decay and mental illness; they were strong, sturdy and attractive; and they produced children with ease, generation after generation” (xi Fallon, *Nourishing Traditions*).

Although the particulars varied from place to place, Price documented

these shared characteristics of traditional diets:

1. The diets of healthy, non-industrialized peoples contain little to no refined sugar, white flour, canned foods, low-fat milk, hydrogenated vegetable oils, protein powders, synthetic vitamins, or artificial colourings.
2. All traditional cultures regularly consume animal food and products such as dairy products and eggs. The whole animal is consumed – meat, organs, bones, and fat.
3. Their diets contained at least four times the minerals and water soluble vitamins, and ten times the fat soluble vitamins found in animal fat (A, D, and K₂) as compared to the standard American diet.
4. Some animal products were consumed raw.
5. Their diets are rich in fermented vegetables, fruit, drinks, dairy products, meat, and condiments.
6. Seeds, grains, and nuts are soaked, sprouted, and fermented.
7. Total fat content of their diets varied between 30-80% of calories; however, only 4% of which came from polyunsaturated oils found in grains, legumes, nuts, fish, animal fats, and vegetables. The remainder of the fat calories came in the form of saturated and monounsaturated fats.
8. Traditional diets contained equal amounts of omega 3 to 6.
9. They all contained salt.
10. They all consumed animal bones and gelatin-rich bone broths.
11. Traditional cultures typically provided nutrient-rich animal foods for prenatal nutrition, pregnant and lactating women, and growing children (118-119 Wallach).

If a paleo or traditional diet is a new concept to you, this may seem fairly radical, especially the high consumption of (quality) fats from animal sources. There are many books and many thousands of papers to back up the newest conclusions on fats and the culprits behind modern day epidemics. See the references for a few starting places.

Although referring to a “blueprint” of an ancient human diet such as paleo authors do is a reasonable reference point, our understanding of

human history is still the subject of debate and is revised on nearly a weekly basis as older and older signs of civilization appear. There are solid claims to lost civilizations, evidence of which at least exceeds 15,000 years in age (for instance, refer to the work of Robert M. Schoch, Ph.D. re Egyptian artifacts, Graham Hancock, et al). Still newer archeological evidence in Europe shows advanced architecture dated some 75,000 years (see the work of Dr. Sam Osmanagich). And for a truly dizzying thought, consider the archeological information collected by Michael Cremo in *Forbidden Archeology* or its abridged version, *The Hidden History of the Human Race*, that finds still more ancient evidence of humankind. The implication here is that agriculture may be immensely older than what the current narrative of human history tells us. While the matters of our origins remain to some degree or other shrouded, the examples of superb human health on traditional diets is not abstract, as evidenced in Dr. Price's and many others' research and in the testimonials of those who have adopted its principles.

I have personally found the traditional diet to be the most suitable to self-reliant gardening and food security as well as the most satisfying diet by far, and I have tried a number - paleo, ketogenic, ayurvedic, vegetarian, and vegan. For more information, see *The Primal Diet: Paleolithic and Ancestral Diets for Optimal Health* by Ron Schmid (ND), westonaprice.org, and the references listed in the bibliography.

YOUR STAPLES

The following are a handful of traditional-diet inspired staples for you to consider for your gardening for food preparedness. There is lots of free information out there on how to culture and store these staples, so I won't rehash those techniques here except for any unusual observations.

POTATOES

Typical Spacing – 12-16” between plants, 2.5-3’ between rows

Dry-Gardening Spacing – 18-24” between plants, 3-4’ between rows

Yields – Roughly 250lbs per 100 row feet

The lowly spud. Not explosive in taste nor exotic in appearance, but it is arguably the backbone of your staple crop production. Old-school homesteaders would never be without hundreds of pounds of potatoes, recommending, as does self-reliant legend John Seymour, you plant a quarter to a third of your gardening space to the humble potato. I cannot agree more. Whatever failures I have had by my own hand or by nature's, my reliable harvest of potatoes whisper up to me from the cold storage that it will all be okay. In pre-potato famine Ireland, many peasants ate a nearly all-potato diet for parts of the year. The average Irishman ate – somehow – something like 13 pounds a day during fall and early winter. The ladies and little ones managed something like 9 pounds. That translates into about 4500 and 3100 calories with 120 and 80 grams of protein, respectively. What I am getting at is that, if all else fails, you and your family can get through a sudden food crisis just on potatoes – it would not quite be fine dining, but you would be alive and kicking and could wait out whatever crisis it was.

Potatoes are very versatile. They come in a spectrum of textures between waxy (less starchy) and mealy (more starchy). Waxy types are great boiled, in stews, in potato salads, and so on; the mealy or

fluffy types are better for frying and being mashed. Some of the halfway varieties can multifunction quite acceptably in a stew, fried up, or in mashed. We love to pre-boil and fry our potatoes with lots of butter, some salt, and some herbs. Another personal favourite is potatoes *au gratin* made with chicken broth and sour cream or plain yoghurt.



If times are good and/or you want to be careful with your carb intake, you can make root smash with other roots that are very low in carbs together with your spuds. I make ours with about equal parts potatoes and turnips, 1/3 part carrot and onion, and boil them until soft. Then I drain, add lots of butter, maybe some coconut oil, and maybe some bacon fat; then I add salt and milk or cream (or alternative), or a large dollop of plain yoghurt and mash it all up. It's delicious. I have no better way of eating turnips.

As you can see, traditional diets always see a carbohydrate-dominant food like potatoes consumed with, or cooked in, lots of fat to slow the uptake of carbohydrates. This practice lowers the glycemic index of foods by 10 or more points and is always a good practice since we want to avoid swings in blood sugar levels. Worth noting here, too, is

that the process of baking a potato gives it a much higher glycemic index rating (about 93 as opposed to boiled, about 56); so, if you have health or weight challenges, you may want to keep baked potatoes as an infrequent treat. Another potato notable is that the sizeable amount of vitamin C in potatoes is in the skin, so if you can, keep the skins on.

I have until recently cultured potatoes in the standard hilling fashion but plan on relying more on mulching and deep, rolled-down cover crops in upcoming seasons to work more in tune with the soil health principles discussed above.

As I touched on in the dry-gardening section, generally potatoes do great with no supplemental irrigation so long as they have decent spacing and decent ground. You can expect at least one pound of tubers per row foot in the toughest conditions and several times that if all is growing well.

CORN (or not)

“All seeds, nuts, grains, and legumes are the embryos of plants. That may not sound very appetizing, but all plant embryos have actually evolved to get through the digestive tract of mammals in order to grow up in their manure. Plant embryos...have a surface membrane that is very high in lectins, which are anti-nutrients. These are chemicals (glyco-proteins) that irritate the mucous membrane of our digestive system in a way that weaken our ability to absorb our food. They also irritate our immune systems and make our blood cells stick together, making them weaker as vehicles for oxygen and nutrients.

Another anti-nutrient found in grains, beans, nuts, and seeds is phytic acid. This chemical is in plant embryos to protect them from germinating too early and protects the active nutrients inside the embryo to ensure it grows rapidly. When we eat

these foods without treating them, the phytic acid combines or chelates with important minerals such as zinc, iron, calcium, and magnesium and makes them less absorbable in our digestive tract. Phytic acid may also interfere with protein absorption. Keep in mind that this acid not only binds to the minerals in the plant embryo, but may also bind to the minerals in the rest of the meal” - Michael Smith Dr. TCM, from *Returning to an Ancestral Diet*

It is impossible not to address corn and wheat grains in a staples food discussion. Corn has a long history in the Americas and for good reason – it is a calorically rich food that is easy to grow and harvest. But there is a caveat here: Native Americans never ate corn as is. They knew to nixtamalize it – a process of soaking their corn grains in lime or wood ashes, which would loosen the tough hulls of ancient forms of corn together with chemically neutralizing its “anti-nutrients” (like phytic acid), releasing its vitamin B3 (niacin), and enhancing its protein and mineral bioavailability. When Americans relied heavily upon corn without processing it in this way, deficiency diseases like pellagra were the result. My own health care professional, a Doctor of Traditional Chinese Medicine who happens to be part Native American and a loud supporter of a Traditional or Ancestral Diet, dismisses corn altogether from his dietary recommendations because, for one, it is an irritant when not prepared correctly. Sally Fallon, the author of *Nourishing Traditions* and traditional diet authority, maintains that corn be nixtamalized as per tradition, just as other grains and legumes require their treatment, or else it is sub-par food with the potential to actually rob you of nutrients (calcium, magnesium, copper, iron, and especially zinc are bound by phytic acid) and lead to serious mineral deficiencies. Again, this is why no traditional cultures ate their grains without special treatment. If you shall not be deterred, you can purchase lime water to soak your cornmeal. It goes without saying that GMO corn is highly toxic for entirely different reasons and should never be eaten by humans or animals, as independent studies have graphically demonstrated.

That all said, if you are in good health and are sure that corn agrees with you, modest amounts of corn for emergency calories in hard times seems acceptable, and you can put your pellagra fears to bed so long as you are eating some variety – and some eggs.

OTHER GRAINS – WHEATS, RYE, BARLEY, OATS

Yield – per 100 square feet, roughly: 10lbs (oats), 20lbs (rye, wheat)

A major difference between corn and other common grains like wheat is that the latter can be properly treated very easily, making them far more digestible and nutritious. Traditional approaches were to soak (with an acid medium like lemon juice or vinegar), sprout, or ferment grains, nuts, seeds, and beans, which removes the phytic acid and enzyme inhibitors. The treatment will of course depend upon what you plan on doing with the grain in question. Wheat can be soaked, sprouted, dried, and then ground up, for example. In one of the isolated villages that Dr. Weston Price studied in Switzerland, they fermented their rye bread for two weeks!

Sprouting glutinous grains does reduce gluten content and greatly improve digestibility, but it does not remove gluten entirely. So, if you are gluten intolerant, sprouted glutinous grains are still (probably) off-limits, but you can grow oats, which are gluten-free. Ancient grains like einkorn have a very different starch and protein make-up and are reputedly much more digestible. If you are just gluten sensitive and not intolerant, like myself, you may find that soaked, sprouted, or fermented glutinous grains give you no grief at all.

While it is true that cereal grains will not yield anything so much as potatoes (or corn) for the same space, there are other distinct advantages if we have the space for them. Our ancestors in the West didn't grow so much of it for nothing. They are calorically rich, for one, having about 600 calories per cup. Cereal grains, especially

ancient varieties, also grow with ease in a very wide range of environments and in poor soil. This past summer I tried a “medieval” heirloom wheat that I planted in very rocky, weedy ground and then promptly forgot about it. After months of drought, I happened to notice a band of lovely stalks in this abandoned little space, almost ready for harvest. No water, scorching heat, and awful soil – now that is a resilient crop.



The ease and length of storage for cereal grains is another big advantage. Potatoes will only keep till early spring in typical storage conditions, but grains will be edible for years (but maybe not viable as planting seeds). All you need to do is keep the grain dry, cool, and protected from critters. A sealed pale in the basement will probably do, assuming you have properly dried your harvest.

I have only a couple of remarks to add to what you can find out there for free on the culturing and harvesting practices of growing cereal grains. One is that many dismiss grains as being too difficult to harvest. That just isn't so. Threshing (the action of beating the seeds out of the seed heads) is the only challenging part, and it's pretty easy in the scheme of things. I use a long, thin stick that has a prong at the end and casually whack the pile of stalks on a tarp. I stir it around here and there and keep whacking. If I had hundreds of pounds to

thresh, alright, that would be more serious (no harder than hilling a field of potatoes), but that would also be food abundance with artisanal sourdough breads for the year and then some. Winnowing (using wind or a fan to blow the chaff away from the grain as it is poured into a receptacle) is kind of tricky but not hard. A large fan will make it easy, which I haven't bothered to procure; instead, I rely on a tiny fan or on the whimsy of actual wind, old-school style.

Oats are somewhat of a special case in regards to threshing and winnowing. Typical oats have a clingy husk that requires extra steps to remove. The traditional Scottish method is to kiln the oats (or use a dehydrator set to about 50 C) to dry them completely, and then pass them between two millstones set widely apart. This gently cracks the skin off the oats. Then they are winnowed and passed through another milling set to grind the oats roughly. That does sound labour intensive. Or, preferably, you can get so-called "hull-less" oats whose hulls come off much easier.

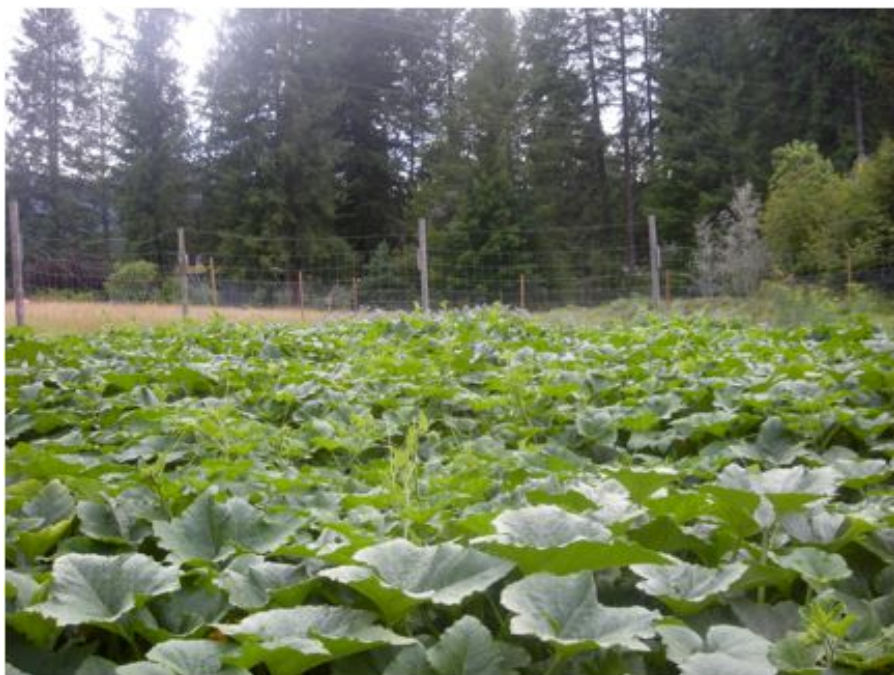
Ergot on rye is worth mentioning too. I had never come across ergot in my readings except once. It is a fungus that presents as black, bulbous growths growing in place of individual rye grains. They contain poisonous substances related to LSD that cause hallucination and, eventually, serious symptoms of poisoning. The spores can overwinter in the field or keep on contaminated seeds in storage. I must have gotten a tainted sack of rye a couple of years ago because I had ergot sprinkled through my stands and would not dare eat any or save any for seed.

Planting cereal grains can be done by broadcasting, but using a one-person seed drill (like the Earthway precision garden seeder) is vastly more efficient and effective, and you get pretty rows out of it too.

(WINTER) SQUASH

Yield – per plant, 3-5 squash of 10-15lbs each (large fruited varieties);
10-15 squash of 3-5lbs (small fruited varieties)

Winter squash is another classic staple crop of the New World that provides about 80 calories per cup (about the count of a slice of bread), which is composed of almost entirely carbohydrates. Winter squash is especially high in beta-carotene (over 450% of the daily recommended value in one cup). Squash is a digestible, gentle food that is a good staple in general for those with weight or digestive problems. It also has the advantages of requiring no special culturing, it is a breeze to harvest, and it stores for many months after being cured properly.



If you have not grown them before, you will find a mess of suggestions over the spacing of squash plants. I have learned the hard way that growers who have a longer season (than my measly 120 days) can space their winter squash further apart and see their plants continue to grow and produce. With a short season, that spacing will leave you with lots of immature squash once frost rolls in and not many mature ones. Tight spacing comes in around 2.5 feet within the row in a 3-foot wide bed and extensive, dry-gardening spacing comes in around about 5 feet between plants within the row and 8 feet between rows.

That winter squash can handle itself very well with limited irrigation is another advantage that is rarely mentioned in typical gardening books. Its roots are as extensive as its sprawling vines, making it a great scavenger for moisture. I tested this a couple of years ago, planting the squash widely, as above, and only watered a little later in the season out of nervousness. Squash may not be as drought-resistant as certain potato varieties or grains, but it definitely qualifies as a resilient crop in this respect.

LEGUMES (BEANS & PEAS)

Whereas potatoes, (corn), and squash are overwhelmingly composed of carbohydrates, your legumes is where you can grow your own protein. Self-sufficient old-timers recommend about a quarter of your growing space be dedicated to legumes because of this crucial contribution of protein. Just one dry cup of black beans is well over 600 calories with over 40 grams of protein. Naturally, legumes are the primary source of protein for vegetarians, although their amino-acid profile is incomplete and require other foods (like potatoes) to get all nine essential amino acids. Because they contain enzyme inhibitors and anti-nutrients, legumes need to be carefully soaked or fermented. Roughly speaking, you want to soak one cup of legumes in three cups of hot water with $\frac{1}{4}$ cup of vinegar or lemon juice thrown in. Some require less than 24 hours of soaking, but as a general rule you can soak them all for 24 hours while changing the water once or twice. You will notice the difference in digestibility.

Unlike most garden crops, legumes require very little fertility and do fine on poor ground (not dead ground, mind you). Thanks to a symbiotic pairing with a bacteria on their roots (*rhizobacteria*), legumes fix atmospheric nitrogen and thus require no nitrogen inputs, a frequent limiting nutrient. You can make use of that feature if you are planting in poor or newly turned ground, and it affords you to give the compost you have to the greedy plants.

There is more variety of garden legumes than you might think: peas, common beans (bush and pole), runner beans, fava beans, chick peas, tepary beans, cow peas (like mung), lima beans, soy beans, and lentils. Some are not worth growing because they yield so little on the home scale, like lentils. Chick peas yield poorly too, but many adore them and shall not do without. Cool season legumes are fava beans, chick peas, and peas. These would suit early plantings that beat the heat or maritime climates. The other legumes love the heat and are incredibly resilient to soaring temperatures. Things to consider are what legumes you actually like (or are open to liking), when you want to plant, how long your season is, and which varieties will work best in your climate.

For illustration, last season I grew common bush beans (Black Coco) and tepary beans (Black Milta) along with peas, which were started much earlier. The tepary bean is a southwestern bean that is especially high in protein (up to 30%), drought tolerant, and fast-maturing...so they say. Although both of these bean varieties passed the heat test with flying colours, being perfectly happy in recurring days of 42C (106.7F), they both matured too slowly. The tepary beans matured no faster than the bush beans, contrary to their reputation. Rain and damp cool weather returned just as they were drying down, which led to some mould and even some beans sprouting in their pods. I still got plenty of edible beans, but the experience was a turn-off all the same. I have also grown mung. They, too, are incredible in the heat and in poor soil, and they mature in time, but their yield is on the low side. These are the kind of factors to sort out as you determine your approach to legumes.

With their low input requirements and tolerance to extreme heat and drought, many legumes are certainly a resilient crop that would fare well with disruptions to irrigation or availability of soil amendments or compost. Additionally, they are easy to grow, and, when dried down properly, store extremely well too. Threshing the plants is the only somewhat laborious task, requiring you to step and stomp on piles of dry plants to separate the beans from their pods (on a tarp),

and then winnowing as with grains.

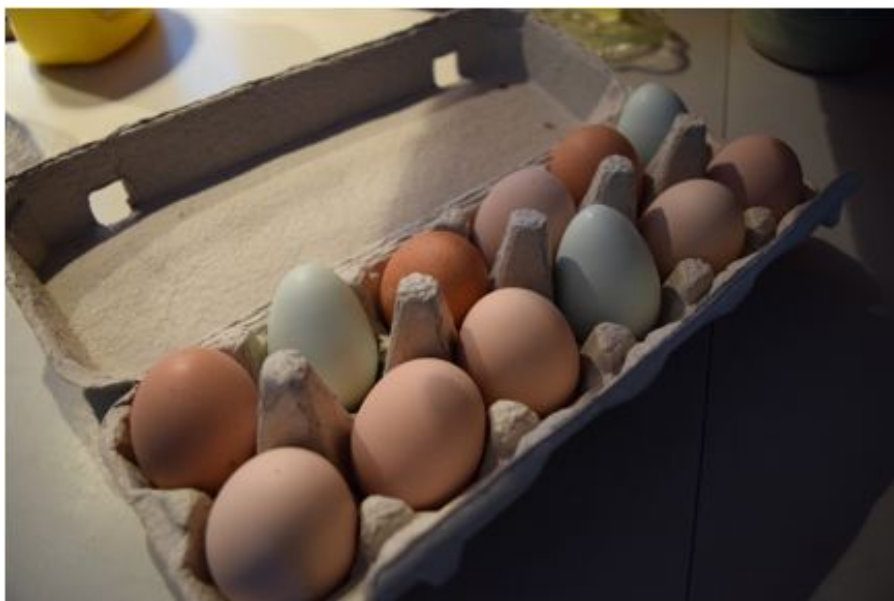
EGGS



Eggs are an absolutely vital staple “crop” for a small-scale food preparedness system. No plant can come close to quality and quantity of protein and fats from good quality, free-range, happy hens’ eggs. Chickens turn things you cannot eat, like weeds, grass, and insects, into eggs. That point is worth belabouring a little because critics of animal products often cite stats based on industrial practices that are abhorrent to an average homesteader. They argue that when we feed, say, 100 calories of grain to animals, we get far fewer calories back in the form of animal products. A chicken reportedly gives back just 22 calories in her egg of the 100 calories you have given her, and, so, we should eat fewer animal products and eat that animal feed directly. In an isolated system where chickens live in cages their whole lives, this math makes sense, but it certainly does not apply to free-ranging animals. Free-range chickens can get most or all of their food from their foraging during much of the year, eating bugs and greens in a properly rotated grazing system. And boy do they do a great job at bug hunting. They can find the smallest bugs and eat them with incredibly precise pecking. On the other hand, I

sometimes see them chasing each other over a captured mouse. And, in the dead heat of summer when grasshoppers approach plague levels, our hens are dashing every which way, getting their fill. When you add that they also get household scraps and garden excesses, the efficiency of chickens is excellent, to say nothing of the huge value we get from eggs that we cannot get from plants. How much purchased feed you need to rely on depends on the size of your flock, their ranging conditions, and the kind of winter you have. If you dive into getting some of your own hens, I highly recommend *The Small-Scale Poultry Flock* by Harvey Ussery, who discusses home-based feeds, and everything else, in detail.

So, what about those eggs? A 2007 Mother Earth study confirmed what our taste-buds already knew – free range eggs measured vastly higher in nutrition to those produced by commercial, cage-bound chickens. Free-range eggs from a cross-section of 14 farms had an average of 7x more beta carotene, nearly 4x more vitamin E, 3x more omega-3, and 2/3 more vitamin A than eggs from commercial farms. Those are huge figures! Each egg totals about 75 calories; the white is about 6 grams of protein. Or, in other words, a dozen eggs is about three steaks' worth of protein.



Many have the impression that the cholesterol in eggs is unhealthy,

but this has been soundly disproven in study after study. Cholesterol is a required nutrient used for a huge myriad of physiological functions such as being the building block for all our hormones, for building cellular membranes, repairing wounds, and supporting brain health. There is, in fact, no way you can eat enough cholesterol from a normal diet to meet your cholesterol needs each day; your liver produces the rest that your body requires.

Chickens also contribute to your whole system in a variety of ways. You can use them as your “Animal Impact” (soil building principle #5 discussed in the previous chapter), and their manure can be used for fertility, such as in your compost. They are also great company. Many find their goofy ways comforting. Carol Deppe remarks that it is hard to stay depressed when she sits out with her ducks for long, and I find this true as well. Even my newborn baby took comfort in the colours and clucking of our flock looking back at her.

Clearly, if we have a lot of land we can think about more serious animal ownership. In his *The Self-Sufficient Life and How to Live It*, John Seymour says that a homestead ideally possesses a cow with optional chickens, pigs, ducks, and goats. He explains that although you would have to buy the feed for the cow on a smaller homestead (say, 1 acre), the cow could then provide all the manure and nutrition for everything else. It is key to note that although we could handle a short-term disruption to food supply with vegetable staples, for real health and long-term security we require the nutrition of animal products that either we raise to some degree or that we obtain from other homesteads and farms in our region, even if that only means dairy products.

ROOTS

Now that we have the main individual staples covered, we can add in roots as a staple category. Most roots are easy to grow, productive, and store well – and they are crucial for flavourful cooking! Onions, garlic, (and let’s squeeze leeks in), carrots, parsnips, and beets are

some mainstays, but you might add many others like salsify, gobo, celeriac, sunchoke (jerusalem artichoke), yacon, parsley root, and others. From a practical standpoint, we have found that focusing on fewer crops that we know we use a lot is a better use of our limited space and ensures that we have large amounts of the staples we would like to have.

Garlic deserves a special mention because it is also a potent herbal medicine that has an incredible array of applications. Herbalist Lalitha Thomas of Rasa Creek Farm, a garlic farm here in British Columbia, provides a free chapter on garlic from her book, *10 Essential Herbs*, downloadable from their website. There, you will see just why garlic deserves special mention, especially in the context of preparedness. We may not have access to normal medical care in a chaotic societal situation – especially if the problem isn't acute – and a powerful anti-viral, anti-inflammatory, anti-fungal, and anti-bacterial herb like garlic can step in to help in a serious way.



BRASSICA FAMILY / FERMENTABLES

The brassica family is the cabbage family, which includes kohlrabi, turnips, kale, broccoli, cauliflower, and Brussels sprouts. This family has powerful health benefits and cabbage makes the common

backbone to one of the best traditional foods that we can eat – fermented vegetables. For one, fermenting vegetables is a method to preserve them for the winter without freezing, boiling, or using sugar, oil, or vinegar. The starches and sugars in the vegetables are converted into lactic acid by the many species of lactic-acid producing bacteria called *lactobacilli*, which are present on the leaves of plants, especially those growing close to the ground. The lactic acid they produce is a natural preservative that inhibits putrefying bacteria.

If that weren't convincing enough, fermenting actually increases the nutrition of the vegetables. Sandor Katz writes in *Wild Fermentation* that as the *lactobacilli* go through their life cycle they create “B vitamins, including folic acid, riboflavin, niacin, thiamin, and biotin” (6). They predigest food, making it easier to digest. They also produce enzymes together with anti-biotic and anti-carcinogenic substances, and promote healthy gut flora (89 Fallon).

There are various kinds of ferments, of course, from your standard sauerkraut and Korean kimchi to all kinds of fermented fruit and vegetable mixes from around the world. Some more palatable than others. After breezing through Katz's book, I thought I would try *sauerrüben*, a ferment of turnips that he reports to be delicious. Our chickens thought so, at least.

So, having a section of our garden devoted to fermentable vegetables like cabbage is a traditional and incredibly healthful way of having super-food vegetables through the winter. It is really convenient, too. We make sauerkraut, kimchi, and pickles as our main ferments. There are endless variations of kimchi, but we tried a Fallon recipe last year that was outstanding. It contains cabbage, green onions, carrots, daikon radish, ginger, garlic, some chili flakes, and salt. You can see that you get a nice, digestive mix of veggies in each dollop.

Besides growing brassicas as fermentables, turnips are an easy and productive root crop; kale is a super-food that will stand well into the cold season; and Brussels sprouts and broccoli make for great,

nutrient-dense greens good for the freezer.

PUTTING IT ALL TOGETHER – GARDEN PLANS

Our traditional-inspired staple categories, therefore, look like this:

- potatoes
- squash
- grains
- roots
- legumes
- brassicas & fermentables
- & miscellaneous

The space you devote to each of these depends on how much space you have overall and your needs. For a modest to large garden, a general starting place suggested by the “father of self-sufficiency,” John Seymour, is a quarter devoted each to potatoes, roots, legumes/brassicas, and miscellaneous (squash, tomatoes, salad greens, etc).

For us, we have about 4,500 square feet of decent garden space broken down like this:

- 1/4 to potatoes
- 1/4 to brassicas/fermentables (cabbage, broccoli, Brussels sprouts, kale, kohlrabi, daikon radish)
- 1/4 to roots (garlic, leeks, carrots, parsnips)
- 1/4 to legumes/grains and miscellaneous (tomatoes, squash, pole beans for drying, drying peas, beans or grains)

About 500 of those square feet is our kitchen garden that we stuff with more typical summer eating garden treats like fresh peas and beans, tomatoes, beets, carrots, cucumbers, peppers, kale, salad greens, and zucchini.

With two hungry active people and a baby, that breakdown works pretty well for us. It is definitely enough to absorb a food crises comfortably, and until then it offsets our grocery costs and provides us

with delicious home-grown food.

5

A WORD ON TOOLS & SEED SAVING + GREAT INFORMATION SOURCES

TOOLS

I have wasted a lot of money on tools that I never really needed. The most minimalist approach I have encountered is to possess a rake, a hoe, a shovel, a sharpening file for your hoe and shovel, a wheel barrow, and a watering can. You can turn ground and do all manner of digging and heaving stuff with a shovel; you can stir, weed, hill, and the like with a sharp hoe. If you are not rich in currency, a good rake, shovel, hoe, file, and wheelbarrow will go a very long way indeed.

I have found that the “peasant hoe,” sometimes called an Italian or grape hoe, to be much more useful than a standard hoe. If your land is at all rough, the heavier, tougher peasant hoe will take the abuse much better and in this sense it is a much more resilient tool. I have slammed countless rocks and hacked many a root and mine keeps ticking.

Beyond the bare basics, here are some other tools to think about: a scythe and/or sickle for chopping down green manures, mowing, or harvesting grains; a small grain mill if you are growing grains; good gloves and shoes; a pitch fork and/or a mulch/compost fork; a compost thermometer; a mattock for breaking up rough ground with rocks and roots; a three-pronged cultivator, trowel, and clippers.



SEED SAVING

The practice of seed saving is naturally vital to preparedness, but it is a subject beyond the scope of this book. There is lots of free seed saving information there to get you started. On a small scale, you may only be able to grow some seed some of the time. For example, your brassicas will cross with each other, so you can only grow one out at a time for seed. The rest you will have to get in bulk and freeze to keep for the long-haul.

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